

VITA

Joseph A. Carlson

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Interests & Skills

Studies of Quantum Few- and Many-Body Systems:

Light Nuclear Reactions - structure, electroweak response
and reactions of astrophysical relevance.

Strongly Correlated Systems: nuclear and neutron matter and electronic systems

Quantum Monte Carlo Methods: Structure and Reactions

Large Scale Simulations

Employment History

Staff Member, Theoretical Division,

Los Alamos National Laboratory, September 1989 - present

J. Robert Oppenheimer Fellow, Los Alamos National Laboratory, 1986 - 1989

Junior Research Scientist, Courant Institute of Math Sciences, 1983-1986

Research Assistant, U. of Illinois, 1980-1983

Teaching Assistant, U. of Illinois, 1978-1979

Education

Ph. D. in Physics, U. of Illinois at Urbana-Champaign, October, 1983

M.S. in Physics, U. of Illinois at Urbana-Champaign, June, 1979

B.S. in Physics, Georgia Institute of Technology, October, 1977

Honors, Service, etc.

American Physical Society Fellow

APS/DNP Fellowship Committee (2000-)

Advisory Committee, National Institute for Nuclear Theory, U. Washington, (1998-)

Program Advisory Committee, Indiana University Cooler Facility, (1998-)

Physical Review C Editorial Board (1998-)

APS Division of Nuclear Physics Program Committee Member (1991-1993),
Nominations Committee Member (1998)

Intl. Advisory Committee for Recent Progress in Many-Body Theories, 1998-present
Nuclear Physics Coordinator for Computational Science Initiative, 1998

Co-organizer, 'Numerical Methods for Strongly Interacting Quantum Systems',
program, Institute for Nuclear Theory, 9/97-12/97

Energy Research Supercomputer Users Group Executive Committee Member (1989-1993)

Publications - Refereed Journals

1. ‘Longitudinal and Transverse Quasi-Elastic Response Functions of Light Nuclei’, LA-UR-01-3235, submitted to Phys. Rev. C.
2. ‘Realistic Models of Pion-Exchange Three-Nucleon Interactions’, Steven C. Pieper, V. R. Pandharipande, R. B. Wiringa, and J. Carlson, LA-UR-01-1907, Phys. Rev. C64 (2001) 014001.
3. ‘Benchmark Test Calculation of a Four-Nucleon Bound State’, H. Kamada, *et al.*, LA-UR-01-1906 (accepted for publication in Phys. Rev. C)
4. ‘Suppression of Kaon Condensation in Dense Matter’, J. Carlson, H. Heiselberg, and V. R. Pandharipande, Phys. Rev. C **63**, 017603 (2001).
5. ‘Quantum Monte Carlo calculations of A=8 nuclei’, R. B. Wiringa, Steven C. Pieper, J. Carlson, and V. R. Pandharipande, Phys. Rev. C **62**, 014001:1-23 (2000)
6. ‘Issues and Observations on Applications of the Constrained-Path Monte Carlo Method to Many-Fermion Systems’, J. Carlson, J. E. Gubernatis, G. Ortiz, and Shiwei Zhang, Physical Review B59, 12788 (1999)
7. ‘Structure and Dynamics of Few-Nucleon Systems’, J. Carlson and R. Schiavilla, Reviews of Modern Physics **70**, 743 (1998).
8. ‘Weak Capture of Protons by Protons’, R. Schiavilla, et. al., Phys. Rev. C**58**, 1263 (1998).
9. ‘Quantum Monte Carlo Calculations with $A \leq 7$ ’, B. S. Pudliner, V. R. Pandharipande, J. Carlson, Steven C. Pieper, R. B. Wiringa, Phys. Rev. C**56**, 1720 (1997).
10. ‘Pairing Correlations in the Two-Dimensional Hubbard Model’, Shiwei Zhang, J. Carlson, J. E. Gubernatis, Phys. Rev. Lett. **78**, 4486 (1997).
11. ‘Quark substructure approach to ${}^4\text{He}$ charge distribution’, L. Wilets, M. A. Alberg, Fl. Stancu, J. Carlson, Phys. Rev. C**56**, 486 (1997).
12. ‘Constrained Path Monte Carlo Method for Fermion Ground States’, Shiwei Zhang, J. Carlson, J. E. Gubernatis, Physical Review B55, 7464 (1997).
13. ‘Neutron Drops and Skyrme Energy-Density Functionals’, B. S. Pudliner, A. Smerzi, J. Carlson, V. R. Pandharipande, Steven C. Pieper, and D. G. Ravenhall, Phys. Rev. Lett. **76**, 2416 (1996).
14. ‘Euclidean Responses of ${}^4\text{He}$ at High Momentum Transfer’, O. Benhar, J. Carlson, V. R. Pandharipande, and R. Schiavilla, Phys. Rev. C**52**, 2601 (1995).
15. ‘Quantum Monte Carlo Calculations of $A \leq 6$ Nuclei’, B. S. Pudliner, V. R. Pandharipande, J. Carlson, and R. B. Wiringa, Phys. Rev. Lett. **74**, 4396, (1995).
16. ‘A Constrained Path Quantum Monte Carlo Method for Fermion Ground States’, Shiwei Zhang, J. Carlson, and J. E. Gubernatis, Phys. Rev. Lett. **74**, 3652 (1995).

17. ‘Variational Monte Carlo Calculations of ^3H and ^4He with a Relativistic Hamiltonian - II’, J. L. Forest, V. R. Pandharipande, J. Carlson, and R. Schiavilla, Phys. Rev. **C52**, 576 (1995).
18. ‘Quantum Simulations of the Superfluid-Insulator Transition for Two-Dimensional, Disordered, Hard-Core Bosons’, Shiwei Zhang, N. Kawashima, J. Carlson, and J. E. Gubernatis, Phys. Rev. Lett. **74**, 1500 (1995).
19. ‘Inclusive Scattering and Dynamics in Light Nuclei’, J. Carlson and R. Schiavilla, Phys. Rev. **C49**, R2880 (1994).
20. ‘Isovector Spin-Longitudinal and -Transverse Response of Nuclei’, V. R. Pandharipande, J. Carlson, S. Pieper, R. B. Wiringa, and R. Schiavilla, Phys. Rev. **C49**, 789 (1994).
21. ‘The Coulomb Sum and Proton-Proton Correlations in Few-Body Nuclei’, R. Schiavilla, R. B. Wiringa, and J. Carlson, Phys. Rev. Lett. **70**, 3856 (1993).
22. ‘Variational Monte Carlo Calculations of ^3H and ^4He with a Relativistic Hamiltonian’, J. Carlson, R. Schiavilla, and V. R. Pandharipande Phys. Rev. **C47**, 484 (1993).
23. ‘Euclidean Proton Response in Light Nuclei’, J. Carlson and R. Schiavilla, Physical Review Letters **68**, 3682 (1992).
24. ‘Effects of Delta-Isobar Degrees of Freedom on Low-Energy Electroweak Transitions in Few-Body Nuclei’, R. Schiavilla, R. B. Wiringa, V. R. Pandharipande, and J. Carlson, Phys. Rev. **C45**, 2628 (1992).
25. ‘The Weak Proton Capture Reactions on ^1H and ^3He and Tritium β Decay’, J. Carlson, D. O. Riska, R. Schiavilla, and R. B. Wiringa, Phys. Rev. **C44**, 619 (1991).
26. ‘On the Absence of Exotic Hadrons in Flux Tube Quark Models’, J. Carlson and V. R. Pandharipande, Phys. Rev. **D43**, 1652 (1991).
27. ‘Radiative Neutron Capture on ^3He ’, J. Carlson, D. O. Riska, R. Schiavilla, and R. B. Wiringa, Phys. Rev. **C42**, 830 (1990).
28. ‘Ground State and low-lying excitations of the Heisenberg antiferromagnet’, J. Carlson, Phys. Rev. **B40**, R846, 1989.
29. ‘Fermion Monte Carlo Algorithms and Liquid ^3He ’, R. M. Panoff and J. Carlson, Phys. Rev. Lett. **62**, 1130, 1989.
30. ‘Alpha Particle Structure’, J. Carlson, Phys. Rev. **C38**, 1879, 1988.
31. ‘Model Hamiltonians for Atomic and Molecular Systems’, J. Carlson, Jules W. Moskowitz, and K. E. Schmidt, J. Chem. Phys. 90, 1003, 1989.
32. ‘Fermion Monte Carlo Algorithms and Liquid ^3He ’, R. M. Panoff and J. Carlson, Phys. Rev. Lett. **62**, 1130, 1989.
33. ‘Stability of Dimesons’, J. Carlson, L. Heller, and T. Tjon, Phys. Rev. **D37**, 744 (1988).

34. ‘Energy and Symmetry of States in Light Nuclei’, J. Carlson, J. L. Friar, and G. L. Payne, Phys. Rev. **C37**, 420 (1988).
35. ‘Green’s Function Monte Carlo Study of Light Nuclei’, J. Carlson, Phys. Rev. **C36**, 2026 (1987).
36. ‘Microscopic Calculations of ^5He with Realistic Interactions’, J. Carlson, K. E. Schmidt, and M. H. Kalos, Phys. Rev. **C36**, 27 (1987).
37. ‘Mirror Potentials and the Fermion Problem’, J. Carlson and M. H. Kalos, Phys. Rev. **C32**, 1735 (1985).
38. ‘Variational Monte Carlo Study of Oxygen 16’, J. Carlson and M. H. Kalos, Phys. Rev. **C32**, 2105 (1985).
39. Comment on ‘High-Momentum-Transfer Inelastic Neutron Scattering from Liquid ^3He ’, J. Carlson, R. M. Panoff, K. E. Schmidt, P. A. Whitlock and M. H. Kalos, Phys. Rev. Lett. **55**, 2367 (1985).
40. ‘Binding Energies of $\Lambda\Lambda$ Hypernuclei and the 3-body ANN Forces’, A. R. Bodmer, Q. N. Usmani, and J. Carlson, Phys. Rev. **C29**, 684 (1984).
41. ‘Binding Energies of $\Lambda\Lambda$ Hypernuclei and the $\Lambda\Lambda$ Interaction’, A. R. Bodmer, Q. N. Usmani, and J. Carlson, Nucl. Phys. **A422**, 510, (1984).
42. ‘Variational Calculations of Resonant States in ^4He ’, J. Carlson, V. R. Pandharipande, and R. B. Wiringa, Nuclear Physics **A424**, 47 (1984).
43. ‘Three Nucleon Interaction in 3-, 4-, and ∞ -Body Systems’, J. Carlson, R. B. Wiringa, and V. R. Pandharipande, Nucl. Phys. **A410**, 59 (1983).
44. ‘Quark Model for Baryons Based on Quantum Chromodynamics’, J. Carlson, J. Kogut, and V. R. Pandharipande, Phys. Rev. **D27**, 233 (1983).
45. ‘Hadron Spectroscopy in a Flux Tube Quark Model’, J. Carlson, J. Kogut, and V. R. Pandharipande, Phys. Rev. **D28**, 2807 (1983).
46. ‘A Study of Three Nucleon Interactions in 3 and 4 Body Nuclei’, J. Carlson, and V. R. Pandharipande, Nucl. Phys. **A371**, 301 (1981).

Invited and/or Published Talks or Book Chapters

1. ‘Response in Light Nuclei’, Workshop on Correlations in Nucleons and Nuclei, Institute for Nuclear Theory, March, 2001
2. ‘Precision Models of the NN Interaction and Applications’, Jlab Town Meeting, Dec., 2000
3. ‘Parity Violation in Few-Nucleon Systems’, workshop on Parity Violation, ECT*, Trento Italy, June 2000
4. ‘Three Nucleon Interactions beyond $A=3$ and 4’, XVIIth European Few-Body Conference, Evora, Portugal, September 2000

5. 'Beyond A=2,3, and 4', talk presented at Chiral Dynamics Workshop, Jefferson Lab, July 2000
6. 'Potentials and Possibilities', workshop on the Standard Nuclear Model, Elba, Italy, July 2000
7. 'Proton-Proton Capture Revisited, Invited talk at Spring 2000 APS meeting', Long Beach, CA
8. 'Path Integral Studies of Nuclei: The Computational Frontier', presented at Euresco Conference on "Electromagnetic Interactions with Nuclei", Santorini, Greece, Oct. 5-10, 1999.
9. 'Nuclear Interactions and Currents: from Light Nuclei to Neutron Stars', presented at the workshop on "Fermion Quantum Monte Carlo Methods", Seattle, Sept. 22-26, 1999.
10. 'Recent Studies of the Nuclear Interaction presented at "Many Body X", Seattle, Washington, Sep. 10-15, 1999; LA-UR-99-6770.
11. 'Nuclear Interactions and Few-Nucleon Systems', presented at Argonne Theory Workshop on "Advanced Calculational Methods in the Nuclear Many-Body Problem", Aug. 2-6, 1999.
12. 'Realistic Interactions in Matter', presented at ECT workshop on "The Nuclear Interaction: Modern Developments", Trento, Italy, Jun. 28- Jul 8, 1999.
13. 'Nuclear Interaction and Few-Nucleon Systems', presented at "Symposium on Actual Topics in the Field of Light Nuclear Systems", Cracow, Poland, Jun. 21-25, 1999.
14. 'Many-Body Methods and Few-Nucleon Systems', presented at joint U.S. - Japan seminar on "Symmetry Principles in Many-Body Phenomenon", Honolulu, Feb. 18-22, 1999.
15. 'Three Nucleon Interactions in Light Nuclei', presented at Indiana University Workshop on Few-Nucleon Physics with Stored, Cooled Beams, Indiana University, Sept. 18-20, 1998.
16. 'Particle Mixing and Charge Asymmetric AN Forces', *Mesons and Light Nuclei 98*, Prague (September 1998) (S. A. Coon, H. K. Han, J. A. Carlson, and B. F. Gibson), LA-UR-98-5199.
17. 'Quantum Monte Carlo Methods in Nuclear Physics', in *Quantum Monte Carlo Methods in Physics and Chemistry*, M.P. Nightingale and C.J. Umrigar (eds.), proceedings of NATO-ASI summer school on Quantum Monte Carlo Methods (July 1998), Kluwer, 1999, p. 287.
18. 'Quantum Monte Carlo Methods and Few-Body Nuclei', XVIth European Conference on Few-Body Problems in Physics, Autrans, France, Few-Body Systems Suppl. 10, 1-10 (1999)
19. 'Parity Violation in Scattering of Polarized Cold Neutrons by Helium', INT workshop on Parity Violation in Nuclei, Seattle, June 1998.
20. 'Constraints in Path Integral Simulations of Quantum Systems', workshop on Innovative Monte Carlo algorithms, Los Alamos, NM, Jan., 1998.
21. 'Progress and Prospects in Quantum Monte Carlo Studies of Light Nuclei', in *Innovative Computational Methods In Nuclear Many-Body Problems* H. Horiuchi, Y. Fujiwara, M. Matsuo, M. Kamimura, H. Toki and Y. Sakuragi, Eds., World Scientific, Singapore, 1998; proceedings of the workshop on Innovative Computational Methods in Nuclear Many-Body Problems (INNOCOM97), RCNP, Osaka, Japan, Nov., 1997.

22. ‘Monte Carlo Methods in Few-Body Physics’, Lectures at Few-Body Physics Summer School at the ECT*, Trento, Italy, Sept., 1997.
23. ‘Applications of Constrained Path Methods in Nuclear and Condensed Matter Physics’, Many Body Workshop at the ECT*, Trento, Italy, June, 1997.
24. ‘Constrained Path Methods for Many-Body Problems’, Heraus Seminar on the Theory of Spin Lattices and Lattice Gauge Models, Bad Honnef, Germany, Oct., 1996.
25. ‘Future Prospects for Path Integral Approaches to Nuclear Structure and Response’, XIIIth International Conference on Relativistic Nuclear Physics and Quantum Chromodynamics, Dubna, Russia, Sept., 1996.
26. ‘Paths to More-Than-Few Body Nuclei’, Gordon Conference on Dynamics of Simple Systems, Andover, NH, Aug. 1996.
27. ‘Structure and Response of Light Hypernuclei’, CEBAF workshop on Hypernuclear Physics, Oct. 1995.
28. ‘Recent Progress in Path Integral Calculations of Nuclei’, J. Carlson, 15th European Few-Body Conference, Peniscola, Spain, June 1995, Few Body Systems, Suppl. 8, 32 (1995).
29. ‘Importance of Baryon-Baryon Coupling in Hypernuclei’ B. F. Gibson, I. R. Afnan, J. Carlson, and D. R. Lehman, *Prog. of Theor. Phys.* 117, 339 (1994).
30. ‘Monte Carlo Approaches to the Few-Nucleon Continuum’, R. Schiavilla and J. Carlson, Proceedings of Few Body XIV, Williamsburg, VA, 1994.
31. ‘Y-scaling, Glauber Theory, and Euclidean Response for Light Nuclei’, J. Carlson, presented at the ‘Future Directions in Quantum Many-Body Physics’ workshop, College Station, Texas, January 1994.
32. ‘Monte Carlo Studies of Light Nuclei: Structure and Response’, J. Carlson and R. Schiavilla, Few Body Systems Suppl. 7, Eds. B. L. G. Bakker and R. van Dantzig, Springer-Verlag, Wien, p. 349 (1994).
33. ‘Electron Scattering and Euclidean Response Functions’, J. Carlson, *Workshop on Electron-Nucleus Scattering*, EIPC, Italy, July, 1993, O. Benhar, A. Fabrocini, and R. Schiavilla, eds, World Scientific, Singapore, 1994, pg 79.
34. ‘Euclidean vs. Real-Time Dynamics in Light Nuclei’, J. Carlson, IMACS Conference on Computational Physics, St. Louis, September 1993.
35. ‘Monte Carlo Approaches to Effective Field Theories’, J. Carlson and K. E. Schmidt, Recent Progress in Many-Body Theories VII, Minneapolis, MN, Aug. 1991, LA-UR-91-3023.
36. ‘Variational Monte Carlo Techniques in Nuclear Physics’, J. Carlson and R. B. Wiringa, in *Computational Nuclear Physics Vol 1*, K. Langanke, J. A. Maruhn, and S. E. Koonin, eds., Springer-Verlag, Berlin, 1991.
37. ‘Three Nucleon Interactions in $A = 4 \& 5$ ’, presented at the Workshop on the Nuclear Hamiltonian and Electromagnetic Current in the 90’s, Argonne National lab, Aug., 1991.

38. ‘Light Hypernuclei and the Hyperon-Nucleon Interaction’, J. Carlson, Particle and Fields Series **43**, AIP conf. proc. **224**, Lampf Workshop on π , K Physics, October 1990, pg. 198.
39. ‘Many-Body Theory of Electron-Nucleus Scattering’, J. Carlson, V. R. Pandharipande, and R. Schiavilla; in *Modern Topics in Electron Scattering*, ed. B. Frois and I. Sick, World Scientific - Singapore, 1991, pg. 177.
40. ‘Monte Carlo Methods and Applications in Nuclear Physics’, J. Carlson, *International Summer School on Structure of Hadrons and Hadronic Matter*, Aug 5-18, 1990, Dronten, Netherlands; World Scientific, ed. O. Scholten and J. H. Koch, pg 43.
41. ‘Green’s Function Monte Carlo in Nuclear Physics’, J. Carlson, in *Monte Carlo Methods in Theoretical Physics*; Elba, Italy, June 1990; Ed. Sergio Caracciolo and Adelchi Fabrocini, ETS Editrice, Pisa, 1991, pg 301.
42. ‘Monte Carlo Approaches to Light Nuclei: Structure and Electron Scattering, Arima Symposium - Santa Fe, NM, May 1990 - Nucl. Phys. **A522**, 185c, 1991.
43. ‘Green’s Function Monte Carlo Calculations of Light Nuclei’, presented at the Few Body XII conference, July 1989, Nuc. Phys. **A508**, 141c, 1990.
44. ‘GFMC Study of the Heisenberg Antiferromagnet’, in the *Quantum Simulations of Condensed Matter Phenomena*, Ed. J. D. Doll and J. Gubernatis, Aug 1989, p. 31, World Scientific.
45. ‘Green’s Function Monte Carlo Calculations of ${}^4\text{He}$ ’, J. Carlson, in *Workshop on Electron-Nucleus Scattering*, A. Fabrocini, S. Fantoni, S. Rosati, and M. Viviani, ed., World Scientific, 1989.
46. ‘Microscopic Calculations of Alpha Neutron Scattering’, J. Carlson, K. E. Schmidt, and M. H. Kalos, in *Condensed Matter Theories Vol 1*, F. Malik, ed., 1986, pg. 79.